

REMARKS

Claims 1, 2 and 4-10 are currently pending. Claims 1, 2, 4 and 5 have been amended for clarity and to indicate that the semiconductor device comprises dummy patterns (plural) and via portions (plural). See, for example, Applicants' specification, the paragraph bridging pages 6-7 and the Figures.

I. The Rejection Based on Sugiyama et al

Claims 1, 2, 4, 5, 9 and 10 are rejected under 35 U.S.C. 102(a) as allegedly being anticipated by Sugiyama et al (US Pat. 2002/0040986).

Applicants respectfully submit that the present invention is not anticipated by or obvious over the disclosures of Sugiyama et al and request that the Examiner reconsider and withdraw this rejection in view of the following remarks.

As recited in claim 1, the present invention has a feature that the plurality of dummy patterns are adjacent to each other and disposed at even intervals so as to make a pattern density of elements formed from the conducting layer substantially uniform in plane. On the other hand, the dummy patterns of Sugiyama et al are provided so as to render the proportions of the holes in the plurality of masks, such as masks for use in a process for forming through holes and masks for use in a process of forming aluminum wires, to be substantially identical to each other.

Thus, as shown in FIG. 6 of Sugiyama et al, the dummy patterns of Sugiyama et al are not always formed near the interconnection structures. The dummy patterns of Sugiyama et al are formed in the vicinity of the outermost periphery of the memory cell region. Sugiyama et al

neither teaches nor suggests the plurality of dummy patterns which are adjacent to each other and disposed at even intervals so as to make a pattern density of the conducting layer substantially uniform in plane. Thus, the dummy patterns of Sugiyama et al are clearly different from those of the present invention and Sugiyama et al does not teach or disclose the semiconductor device of as claimed.

The present invention is also characterized in that the dummy patterns formed near the interconnection structure and positioned thickness-wise are connected to each other in order to prevent the inter-layer insulating film formed near the interconnection structure from being cracked or peeled by the mechanical stress and/or thermal stress applied to the interconnection structure. Again, as described in claims 1, the dummy pattern of the present invention has a feature that the pattern includes a plurality of discrete patterns which are adjacent to each other and disposed at even intervals so as to make a pattern density of the conducting layer substantially uniform in plane. As shown in FIG. 2 of the present application (reference number 7), the dummy pattern can be formed by simply arranging the simple square discrete patterns periodically. A dummy pattern is formed in each of the interconnection layers, whereby the arbitrary discrete patterns formed in an arbitrary region can be connected to each other in thickness-wise in order to increase the strength of the inter-layer insulating film near the interconnection structure without greatly increasing the design work for preparing the mask patterns of the interconnection layers. The dummy pattern of the present invention is highly applicable for easily increasing the strength of the inter-layer insulating film.

On the other hand, the dummy pattern of Sugiyama et al is provided so as to render the proportions of the holes in the plurality of masks, such as masks for use in a process for forming through holes and masks for use in a process of forming aluminum wires, to be substantially identical to each other. In Sugiyama et al, the square-shaped pattern and the slit-shaped pattern are exemplified as the dummy pattern (see Sugiyama et al, e.g., paragraph [0053]). However, other specific patterns of the dummy pattern are not shown in Sugiyama et al. In particular, Sugiyama et al neither teaches nor suggests the dummy pattern including a plurality of discrete patterns which are adjacent to each other and disposed at even intervals so as to make a pattern density of the conducting layer substantially uniform in plane. Thus, the dummy pattern of Sugiyama et al is clearly different from that of the present invention.

As shown in FIG. 7 of Sugiyama et al, the dummy patterns 102 positioned thickness-wise are connected to each other via the tungsten plug 106. However, in Sugiyama et al, the dummy patterns 102 are connected in order to prevent the electrical potential of the dummy patterns 102 from electrically floating (see Sugiyama et al, e.g., paragraphs [0060]-[0061]). As described above, the dummy patterns 102 of Sugiyama et al is basically provided so as to render the proportions of the holes of the masks to be substantially identical to each other and the specific relationship between the dummy pattern and the interconnection structure is not disclosed in Sugiyama et al. Thus, even though the dummy patterns positioned thickness-wise are merely connected to each other based on the disclosure of Sugiyama et al, the effect of increasing the strength of the inter-layer insulating film cannot be achieved.

As described above, Sugiyama et al is clearly different from the present invention. Sugiyama et al has the technical features and the technical problems different from those of the present invention. The object of Sugiyama et al is also different from that of the present invention. Thus, Sugiyama et al does not teach or disclose the present invention.

For the above reasons, it is respectfully submitted that the subject matter of claims 1, 2, 4, 5, 9 and 10 is neither taught by nor made obvious from the disclosures of Sugiyama et al and it is requested that the rejection under 35 U.S.C. §103(a) be reconsidered and withdrawn.

II. The Rejection Based on Sugiyama et al in view of Secondary References

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiyama et al in view of Hasegawa et al (US Pat. 6,452,274).

Claim 7 is rejected under 35 U.S.C. §103(a) as being unpatentable over Sugiyama et al in view of Matsunaga et al (U.S.P. 6,559,548).

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Sugiyama et al and Matsunaga et al and further in view of Shaffer, II et al (US 2002/0052125 A1).

As discussed in Section I above, Sugiyama et al clearly differs from the present invention and does not provide any motivation for the present invention. Matsunaga et al and Shaffer, II et al neither teach nor suggest the dummy interconnection pattern. Hasegawa et al discloses dummy interconnections. However, as discussed in the previous responses, the dummy interconnections of Hagiwara are not disposed at even intervals so as to make a pattern density substantially uniform in plane.

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Even if the disclosures of Sugiyama et al, Hasegawa et al, Matsunaga et al and Shaffer, II et al are combined, it is respectfully submitted that the present invention would not have been selected and would not have been obvious to one of ordinary skill in the art.

For the above reasons, it is respectfully submitted that the subject matter of claims 6, 7 and 8 is neither taught by nor made obvious from the disclosures of Sugiyama et al, alone or in combination with Hasegawa et al, Matsunaga et al and Shaffer, II et al, and it is requested that the rejection under 35 U.S.C. §103(a) be reconsidered and withdrawn.

III. Conclusion

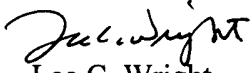
In view of the above, Applicants respectfully submit that their claimed invention is allowable and ask that the rejections under 35 U.S.C. §103 be reconsidered and withdrawn. Applicants respectfully submit that this case is in condition for allowance and allowance is respectfully solicited.

If any points remain at issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the local exchange number listed below.

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If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
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